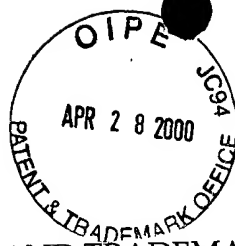


Attorney's Docket No. 003401.P001D1C1



Patent

#1411
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5-8-00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Igor Y. Khandros

Application No.: 09/245,499

Filed: February 5, 1999

For: AN ELECTRONIC ASSEMBLY
HAVING A SUBSTRATE WITH A
PLURALITY OF TERMINALS,
AND A PLURALITY OF
ELONGATE SPRINGABLE
INTERCONNECTION ELEMENTS
CONNECTED TO THE
TERMINALS

Examiner: Cuneo, K.

Art Group: 2831

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Deborah A. McGovern
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Assistant Commissioner of Patents
Washington, DC 20231-9998

AMENDMENT AND RESPONSE TO THE OFFICE ACTION

Sir:

In response to the Office Action mailed December 22, 1999 Applicant respectfully
requests the Examiner to enter this amendment and to consider the remarks that follow.

IN THE CLAIMS

Please cancel claim 40 without prejudice.

Please amend the following claims.

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- 1 39. (Amended) An electronic assembly comprising:
- 2 a semiconductor die having a plurality of terminals; and

3 a plurality of springable interconnection elements, [each interconnection
4 element] each of the interconnection elements having a portion attached to a respective
5 one of the terminals, and a resilient, elongate, free standing section extending from the
6 portion, the interconnection element including a precursor element of a first material,
7 and a second material on the precursor element, the precursor element being flexible
8 without the second material and the second material providing resilient springability of
9 the interconnection element.

1 41. (Amended) The electronic assembly of claim [40] 39 wherein the first material
2 includes a material selected from the group [consisting] of gold, aluminum, copper,
3 silver and platinum.

1 42. (Amended) The electronic assembly of claim [40] 39 wherein the first material
2 includes a material selected from the group [consisting] of gold, aluminum and copper.

1 43. (Amended) The electronic assembly of claim [40] 39 wherein the elongate
2 element has a cross-dimension of between 0.0005 and 0.005 inches.

1 44. (Amended) The electronic assembly of claim [40] 39 wherein elongate element
2 has a cross-dimension of between 0.0007 and 0.003 inches.

1 45. (Amended) The electronic assembly of claim [40] 39 wherein the second
2 material is attached to [the] a respective one of the terminals.

1 46. (Amended) The electronic assembly of claim [40] 39 wherein [the second
2 material dominates] the resiliency of the interconnection element is primarily due to the
3 second material.

IR
(cont) 1 47. (Amended) The electronic assembly of claim [40] 39 wherein the second
2 material is stronger than the first material of the flexible elongate precursor element.

1 48. (Amended) The electronic assembly of claim [40] 39 wherein the second
2 material is a coating which envelops the elongate element.

1 49. (Amended) The electronic assembly of claim [40] 39 wherein the second
2 material includes a material selected from the group [consisting] of nickel, cobalt, iron,
3 copper, gold, platinum, silver, rhodium and ruthenium.

1 50. (Amended) The electronic assembly of claim [40] 39 wherein the second
2 material includes a material selected from the group [consisting] of nickel, cobalt and
3 iron.

1 51. (Amended) The electronic assembly of claim [40] 39 wherein the second
2 material is between 0.00005 and 0.007 inches thick.

1 52. (Amended) The electronic assembly of claim [40] 39 wherein the second
2 material is between 0.00010 and 0.003 inches thick.

1 53. (Amended) The electronic assembly of claim [40] 39 wherein the elongate
2 element has a cross-dimension of between 0.0005 and 0.005 inches and the second
3 material is between 0.00005 and 0.007 inches thick.

1 54. (Amended) The electronic assembly of claim [40] 39 wherein the first material
2 and the second material are both conductive.

1 56. (Amended) The electronic assembly of claim [40] 39 further comprising a
2 barrier layer between the flexible elongate precursor element and the second material.

1 57. (Amended) The electronic assembly of claim [40] 39 wherein the first material
2 includes a material selected from the group [consisting] of gold, aluminum and copper,
3 and the second material includes a material selected from the group [consisting] of
4 nickel, cobalt and iron.

1 58. (Amended) The electronic assembly of claim [40] 39 wherein the elongate
2 element is a core element and the second material is a coating which is deposited
3 around the core element.

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1 59. (Amended) The electronic assembly of claim 39 wherein [each interconnection
2 element] each of the interconnection elements changes direction at least once.

1 61. (Amended) The electronic assembly of claim 39 wherein the interconnection
2 element has a contact region, [distant] spaced apart from the semiconductor die, which
3 remains [distant] spaced apart from the semiconductor die upon depression of the
4 contact region towards the semiconductor die.

C3

1 62. (Amended) The electronic assembly of claim 39 wherein, for [each
2 interconnection element] each of the interconnection elements of a first plurality of the
3 interconnection elements, a contact region distant from the semiconductor die on a
4 given interconnection element is substantially in a common plane with corresponding
5 contact regions of the first plurality of interconnection elements.

1 64. (Amended) The electronic assembly of claim 63 wherein the substrate
2 comprises a material selected from the group [consisting] of a semiconductor die, a
3 printed circuit board, a plastic substrate, a ceramic substrate, and a teflon based
4 substrate.

C4

1 66. (Amended) The electronic assembly of claim 63 wherein [each interconnection
2 element] each of the interconnection elements changes direction at least once.

CS
1 67. (Amended) The electronic assembly of claim 63 wherein, for [each
2 interconnection element] each of the interconnection elements of a first plurality of the
3 free standing interconnection elements, a contact region distant from the substrate on a
4 given interconnection element is substantially in a common plane with corresponding
5 contact regions of the first plurality of interconnection elements.

1 68. (Amended) The electronic assembly of claim 63 wherein the first material
2 includes a material selected from the group [consisting] of gold, aluminum, copper,
3 silver and platinum.

1 69. (Amended) The electronic assembly of claim 63 wherein the first material
2 includes a material selected from the group [consisting] of gold, aluminum and copper.

1 73. (Amended) The electronic assembly of claim 63 wherein [the second material
2 dominates] the resiliency of the interconnection element is primarily due to the second
3 material.

1 74. (Amended) The electronic assembly of claim 63 wherein the second material is
2 stronger than the first material of the elongate element.

1 75. (Amended) The electronic assembly of claim 63 wherein the second material is
2 a coating which [envelopes] envelops the elongate element.

1 76. (Amended) The electronic assembly of claim 63 wherein the second material
2 includes a material selected from the group [consisting] of nickel, cobalt, iron, copper,
3 gold, platinum, silver, rhodium and ruthenium.

1 77. (Amended) The electronic assembly of claim 63 wherein the second material
2 includes a material selected from the group [consisting] of nickel, cobalt and iron.

1 84. (Amended) The electronic assembly of claim 63 wherein the first material
2 includes a material selected from the group [consisting] of gold, aluminum and copper,
3 and the second material includes a material selected from the group [consisting] of
4 nickel, cobalt and iron.

1 87. (Amended) An electronic assembly of claim 86 wherein the substrate comprises
2 a material selected from the group [consisting] of a semiconductor die, a printed circuit
3 board, a plastic substrate, a ceramic substrate, and a teflon based substrate.

1 88. (Amended) The electronic assembly of claim 86 wherein the first material
2 includes a material selected from the group [consisting] of gold, aluminum and copper.

1 91. (Amended) The electronic assembly of claim 86 wherein [the second material
2 dominates] the resiliency of the interconnection element is primarily due to the second
3 material.

1 92. (Amended) The electronic assembly of claim 86 wherein the second material
2 includes a material selected from the group [consisting] of nickel, cobalt and iron.

1 95. (Amended) The electronic assembly of claim 86 wherein the elongate core
2 element includes a material selected from the group [consisting] of gold, aluminum and
3 copper, and the second material includes a material selected from the group [consisting]
4 of nickel, cobalt and iron.

1 97. (Amended) The electronic assembly of claim 96 wherein the substrate
2 comprises a material selected from the group [consisting] of a semiconductor die, a
3 printed circuit board, a plastic substrate, a ceramic substrate, and a teflon based
4 substrate.

1 98. (Amended) The electronic assembly of claim 96 wherein the first material
2 includes a material selected from the group [consisting] of gold, aluminum and copper.

(12)
1 100. (Amended) The electronic assembly of claim 96 wherein [the second material
2 dominates] the resiliency of the interconnection element is primarily due to the second
3 material.

1 101. (Amended) The electronic assembly of claim 96 wherein the second material
2 includes a material selected from the group [consisting] of nickel, cobalt and iron.

(13)
1 104. (Amended) The electronic assembly of claim 96 wherein the first material
2 includes a material selected from the group [consisting] of gold, aluminum and copper,
3 and the coating includes a material selected from the group [consisting] of nickel, cobalt
4 and iron.

1 105. (Amended) An electronic assembly comprising:
2 a substrate having a plurality of terminals; and
3 a plurality of interconnection elements, each including:
4 a elongate element, of a first material, having a portion connected to a
5 respective terminal of the substrate; and
6 a second material on the elongate element, wherein the elongate element
7 is flexible without the second material, and the elongate element and the second
8 material together are resilient [with] primarily due to the second material [dominating
9 the resiliency].

1 106. (Amended) The electronic assembly of claim 105 wherein the substrate
2 comprises a material selected from the group [consisting] of a semiconductor die, a
3 printed circuit board, a plastic substrate, a ceramic substrate, and a teflon based
C3 4 substrate.

1 107. (Amended) The electronic assembly of claim 105 wherein the first material
2 includes a material selected from the group [consisting] of gold, aluminum and copper.

1 109. (Amended) The electronic assembly of claim 105 wherein the second material is
C14 2 connected to [the] a respective one of the terminals.

1 110. (Amended) The electronic assembly of claim 105 wherein the second material
2 includes a material selected from the group [consisting] of nickel, cobalt and iron.

REMARKS

Drawings

Applicant has noted that formal drawings will be required when the patent application is allowed.

The Examiner objected to improper cross hatching in the drawings. Applicant will submit drawings with proper cross hatching when the Examiner indicates that the claims are allowable.

The Examiner also states that the drawings are objected to because those figures showing that which is old are not labeled with a prior art legend. Presently none of the drawings illustrate any features that are exclusively prior art.

The Examiner also stated that the drawings do not show an embodiment of the invention as claimed. Applicant respectfully points out that there are numerous drawings illustrating the invention as claimed including Figure 6C, Figure 8, Figure 10 to Figure 13, Figure 15 to Figure 16, and Figure 18 to Figure 21.

Applicant, accordingly, respectfully requests the withdrawal of the objections to the drawings.

Claim rejections – 35 U.S.C. § 112

The Examiner rejected claims 39-112 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

The Examiner states that in claim 39, line 3 "each interconnection element" should be "each of said interconnection elements." The claims have been amended in accordance with the Examiner's request.

The Examiner states that the use of Markush language go describe an open set, such as that in claim 41, is improper. The Examiner suggested the removal the word "consists." Applicant has amended the claims accordingly.

The Examiner objected to the term "precursor element" as being indefinite because the term does not have sufficient antecedent basis, as in claim 40. Applicant has deleted claim 40.

The Examiner objected to the term "cross-dimension" as being confusing and requested that the term be replaced with "diameter." Applicant submits that the term "cross-dimension" is not confusing as stated by the Examiner. Modifying this term to "diameter" would unnecessarily limit the claims. Applicant accordingly, respectfully requests withdrawal of this rejection.

The Examiner objected to the use of "respective terminal" in for example claim 45. The Examiner requests that the term be changed to "a respective one of the terminals." Applicant has modified the claims in accordance with the Examiner's request.

The Examiner states that the limitations that the second material dominates the resiliency and that the second material is stronger have not been considered from the standpoint of art because these limitations are vague. Applicant submits that these limitations are not vague. According to Applicant's invention composite interconnection elements are formed on a substrate. Each interconnection element is made by first forming a soft, flexible, elongate precursor element of the first material having a base attached to a respective one of the terminals. The precursor element is made of soft material that can be easily formed but is not resilient enough to provide spring properties. The precursor element is then coated with a second material to form a resilient spring. The resiliency of the spring is hardly due to the flexible precursor element but is primarily due to the second material which is deposited on the precursor element. The second material provides the "muscle" of the interconnection element. Claim 46 has been amended by deleting "the second material dominates" the resiliency

of the interconnection element, and changing the understanding to the resiliency of the interconnection element "is primarily due to the second material." Applicant submits that the amendment of claim 46 is sufficiently precise as understood by one skilled in the art and respectfully requests that the Examiner gives the limitations of claim 46 patentable weight. Other claims have been amended in a similar manner.

The Examiner also objected to the use of the word "stronger" in the claims (for example in claim 47). The strength of a material is a material property and is well understood by one skilled in the art. Strengths of materials can be found in many material science handbooks. Claim 47 has been amended by comparing the strength of the second material with the strength of the first material, as opposed to the strength of the flexible elongate precursor element. Applicant submits that such a claim is sufficiently precise and easily understood by one skilled in the art and requests that the Examiner gives the claim patentable weight. Other claims have been amended in a similar manner.

The Examiner also objected to the term "partially returns" in claim 60 because its metes and bounds are unknown. Applicant submits that the metes and bounds are known. Claim 60 states that the interconnection element extends from the semiconductor die, whereafter the interconnection element changes direction, whereafter the interconnection element at least partially returns in direction away from the semiconductor die. Such a structure can easily be drawn on a piece of paper and could for example be a shape as illustrated in Figure 15. Applicant therefore submits that the metes and bounds are sufficiently definite.

The Examiner also requested that the claims be rewritten to describe a shape through its geometry and without reference to movement. Applicant submits that there is no movement described in the shape of the elements. The element is described with reference to the directions in which it extends, being an elongate element. The Examiner requested that claim 59 be rewritten to recite at least one bend. Applicant submits that such a limitation would be unnecessarily limiting. Applicant requests that the Examiner withdraws the rejection in this regard.

The Examiner also objected to claim 61 because of the use of the word "distant" has relativistic implications. Applicant submits that it is common practice to include relativistic terms in a claim. Applicant has nevertheless amended the claim so as to use the term "spaced apart" as requested by the Examiner.

The Examiner also objected to the use of the word substantially in claim 62. Again, Applicant respectfully submits that the use of the word "substantially" is common practice in patent claims and respectfully requests the Examiner to withdraw the objection in this regard.

The Examiner also objected to the use of "readily shaped", for example in claim 65. The Examiner states that it is unclear what a readily-shaped material is. Applicant submits that there is sufficient description in the specification of what a readily-shaped material can be, for example on page 20, line 20, and that the use of such a term is common practice in the art. One skilled in the art would therefore understand what such a term means. Applicant therefore requests withdrawal of the Examiner's objection in this regard.

The Examiner also objected to the use of numerical limitations because one limit of the range is specified to lesser accuracy. Applicant has amended the claims to conform with the Examiner's request.

Claim rejections - 35 U.S.C. § 102

The Examiner rejected claims 39-55, 57-82, 84-112 under 35 U.S.C. § 102(b) as being anticipated by Kanji. The Examiner makes various observations on elements of Kanji. Applicant notes respectfully that the Kanji structure is not freestanding, but rather is constrained at both ends. "Freestanding" can be defined as "unattached to a supporting unit or background" (the Random House Dictionary of the English Language, College Edition 1968). Compare Kanji Figure 1A, where leads 11 are secured by solder or connections or the like at 12 and 13, with application, Figure 5. It is easy to see that the elongate contact structures (502, 504, 506, and 508) are freestanding.

Applicant also respectfully notes that Kanji does characterize lead pins 11 as "resilient" (column 7, line 60, "having large resiliency") but not as "flexible." One skilled in the art when reviewing the present claims would not confuse "flexible" with "resilient" – these are different properties. In the present invention, a flexible core material is overcoated with stronger material to make a resilient structure – the core material is not resilient without the overcoating. Kanji also describes that the lead pins can be made "as small as 0.1 to .03 millimeters." This "minimal" dimension of 100 to 300 microns is dramatically larger than the representative sizes of the present invention (examples of 0.7 mils to 2.0 mils = 15 to 50 microns – spec page 4, line 6). The Kanji materials are inherently much more rigid than soft gold (one representative material of

the present invention, see page 4, line 5). This citation of material from the specification is not intended to limit the claims or the specification in anyway, but rather is intended to highlight some of the differences between the specification and the reference. The point is that the precursor element material of the present invention is not resilient without the overcoating (which is not present in the central portion) and contrasts significantly with Kanji's resilient material.

Applicant, accordingly, respectfully requests the Examiner withdraw the rejection and allow claim 39.

With regard to claims 41-55, 57-82, and 84-112, these claims include all the limitations of claim 39 or limitations that are similar to the limitations of claim 39 discussed above. As discussed above, claim 39 is distinct from Kanji. Therefore, the remaining claims rejected under this heading in view of Kanji are also distinct and are not anticipated by Kanji. Applicant respectfully requests the Examiner to withdraw the rejections of claim 39, 41-55, 57-82, and 84-112 in view of Kanji.

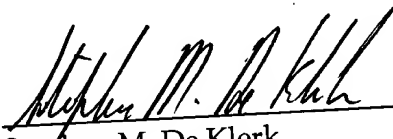
Claim rejections-35 U.S.C. § 103

The Examiner also rejected claims 56 and 83 under 35 U.S.C. § 103(a) as being unpatentable over Kanji. These claims depend from independent claims discussed above and include all the limitations of at least the independent claims. These claims should therefore also be allowable for at least the same reasons discussed above. Applicant, accordingly, respectfully requests withdrawal of the 35 U.S.C. § 103(a) rejections of these claims in view of Kanji.

If there are any additional charges, please charge Deposit Account No. 02-2666.
If a telephone interview would in any way expedite the prosecution of the present application, the Examiner is invited to contact Stephen M. De Klerk at (408) 720-8598.

Respectfully submitted,
BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: 4/25, 2000


Stephen M. De Klerk
Under 37 C.F.R. § 10.9(b)

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